



# BENEFITS OF URBAN CLIMATE ACTION

C40 Cities Technical Assistance Report - May 2020



**MEDELLÍN**  
Electric buses

# CLIMATE, AIR QUALITY AND HEALTH

C40 and Johnson & Johnson are working in partnership to connect the dots between climate action, improved air quality in cities and better health amongst citizens.

C40 has undertaken cutting-edge research, working with 30 cities to date to measure the air quality and health benefits of climate action, and use this to make a stronger case for action.

## The time for urgent climate action

Cities are responsible for about 70% of global CO<sub>2</sub> emissions and play a leading role in limiting global temperature rise to 1.5°C, in line with the Paris Agreement. Simultaneously, cities need to take adaptation measures to protect themselves against current and future extreme weather events,

such as extreme cold and hot weather, floods and droughts. Finally, cities need to attend to local issues of air pollution, including pollutants and toxic compounds.

In order to tackle both air quality and climate change, cities need clean and efficient transport, buildings and industry solutions.

## MEDELLÍN

Located in the middle of the Aburrá Valley, the city is surrounded by 9 other municipalities that together form the metropolitan area of the Aburrá Valley, AMVA, which is the second largest urban agglomeration in Colombia. The city has grown significantly since the 1960's from 400,000 to 2.4 million citizens today.<sup>1</sup>

The main source of greenhouse gas (GHG) emissions is transport, accounting for 42% of the city's emissions.<sup>2</sup>

**42% OF GHG EMISSIONS FROM TRANSPORT**

## THE NEED TO TACKLE AIR QUALITY

Due to the local topography of high mountains and a narrow valley, pollutants are easily trapped in the city, which exacerbates the air pollution issue.

In Medellín, the annual average concentration of fine particulate matter (PM<sub>2.5</sub>) is 20 µg/m<sup>3</sup>, showing that citizens are exposed to harmful levels of air pollution that is two times above the World Health Organisation's recommended value for PM<sub>2.5</sub>.<sup>3</sup>

**PM<sub>2.5</sub> CONCENTRATION TWO TIMES ABOVE THE WHO RECOMMENDED VALUE**

## THE HEALTH BURDEN

Pollutants such as PM<sub>2.5</sub> represent a major risk to people's health, particularly affecting children and older people. Often used as an indicator of air pollution, PM<sub>2.5</sub> can penetrate deep into the lungs and is linked to respiratory and cardiovascular morbidity and mortality, even at low concentrations.

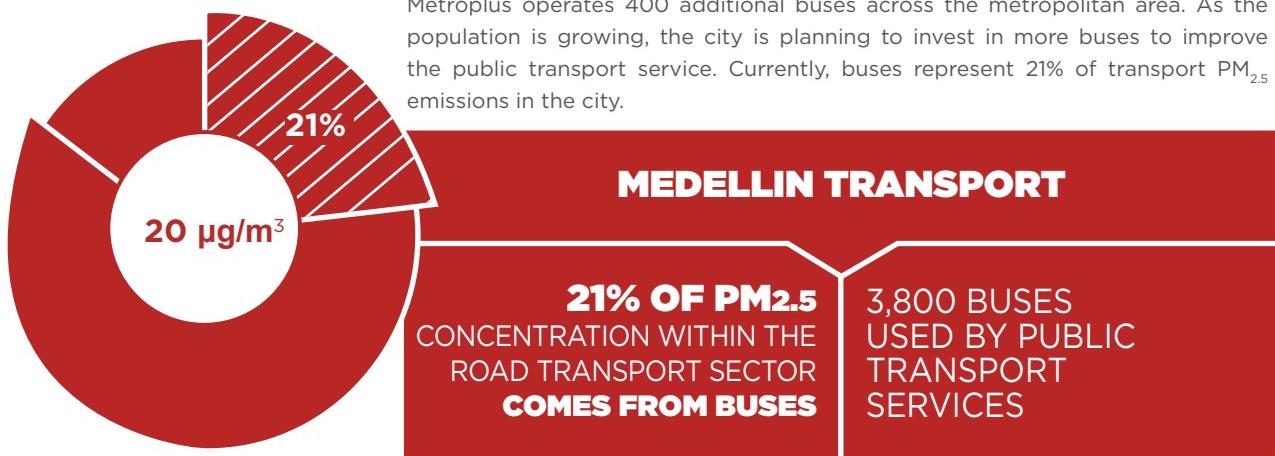
In Colombia, about 11,960 premature deaths every year are attributable to the current ambient PM<sub>2.5</sub> levels.<sup>4</sup>

**11,960 PREMATURE DEATHS EACH YEAR IN COLOMBIA ARE DUE TO AIR POLLUTION LEVELS**

## Understanding the problem

Transport is the main source of air pollution in the Aburrá Valley and contributes 83% of PM<sub>2.5</sub> emissions. Within the transport sector, freight transport is the greatest source of emissions, followed by cars and buses.<sup>5</sup>

Medellín operates 3,400 of the 10,000 registered buses that run in the city, and Metroplús operates 400 additional buses across the metropolitan area. As the population is growing, the city is planning to invest in more buses to improve the public transport service. Currently, buses represent 21% of transport PM<sub>2.5</sub> emissions in the city.



## The action

To tackle air pollution and transform the city into a greener, healthier and more prosperous place to live, the Mayor signed C40's Green and Healthy Streets and Clean Air Cities declarations. The Green and Healthy Streets declaration commits the city to procuring only zero emission buses from 2025 and introducing a major zero emission area by 2030, whilst the Clean Air Cities declaration involves implementing substantive policies to tackle the greatest causes of air pollution in the city.

**"Our citizens have the right to breathe cleaner and healthier air. As mayors, we are entrusted with the responsibility to reduce pollutant emissions in our territories. This is an invitation to all Latin American cities to join us on this journey. So together, we implement zero-emissions transportation systems and strategies that lead us to a cleaner future."** Mr Federico Gutiérrez, Mayor of Medellin, July 2019.

In 2019, 64 new electric buses were purchased by the city. The city is planning to operate 4,000 electric buses by 2025 and 4,850 buses by 2035, as part of the Zero Emission Bus Rapid-deployment Accelerator (ZERBA). The metropolitan area of Aburrá Valley, AMVA, is also planning to operate 540 additional electric buses to reduce emissions at a wider level.



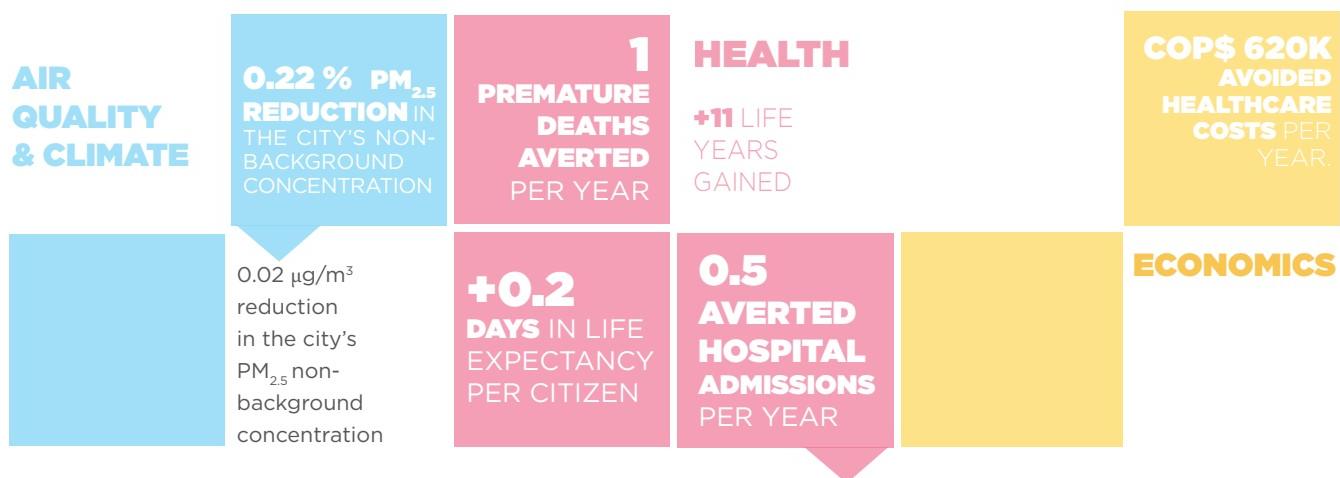
## The benefits

With support from C40, the city analysed the social and economic impacts of switching the city's buses in the current fleet to electric vehicles, as well as analysing a scenario under which all public buses procured by the Public Transport Services (TPC) are electric by 2025.

The air quality improvement leads to a reduction in the health burden of cardiovascular- and respiratory-related diseases and deaths. Hospital admissions are used as an indicator for morbidity, while the change in premature deaths, life expectancy and life years gained are used to quantify mortality impacts.

The economic impact represents the monetary value of averting a hospital admission, showing the impact on the healthcare system.

### 2019: 64 electric buses part of the city's public transport fleet



### 2025: TPC procures 100% electric buses (4,010 vehicles)



24 averted respiratory hospital admissions per year, including 17 due to respiratory diseases and 7 due to cardiovascular diseases.

## METHOD AND ASSUMPTIONS

**Methodology available [here](#).**

**Key assumptions:**

- The air quality monitoring is based on the average over the city monitoring stations in 2018.
- The background concentration was taken from Barbosa Torre Social station, outside the city in 2018.
- Population, health and mortality data is from the national census, results for Medellin municipality and the Health department, from 2019.
- Transport emissions are based on the number of registered vehicles in Medellin, and the annual average distance per vehicle type and fuel, taking the assumption that all the vehicles are operated in the city. Emission factors are euro-factors, and do not take into account traffic congestion or the local road condition.
- Out of the 10,000 registered buses, 3,400 belong to the collective public transport (TPC). TPC is planning to grow to 4,010 buses in 2025 and 4,850 buses in 2030. An average use of public buses of 130km has been taken as a reference. The number of non-TPC vehicles has been kept constant for the analysis.
- Burden of air pollution on mortality was calculated by using the relative risk from published studies that relate air pollution concentrations to health outcomes. This was applied to the difference between city-wide annual average PM<sub>2.5</sub> concentration and the Global

Burden of Disease's theoretical minimum exposure, and to the mortality rate in the local population. This is assuming impacts only in adults (ages 30+).

- Peruvian proxy have been taken for the costs of hospital admissions using conversion rates with PPP for the year 2018.

The analysis has been carried out following the methodology outlined in the BUCA Guidance Manual.

**Notes**

<sup>1</sup> Informe Calidad Aire, Observatorio de Políticas Públicas del Concejo de Medellín, 2017.

<sup>2</sup> C40 Cities, Global Protocol for Community-scale GHG Emission Inventories (GPC), Inventory for the city BASIC+ Scope 3, 2015.

<sup>3</sup> Concentration of PM2.5 annual average over the city monitoring stations in 2018. [Available here](#)

<sup>4</sup> IHME (2019) Global Burden of Disease for Colombia, data from 2017.

<sup>5</sup> PIGECA (2017) Plan Integral de Gestión de la Calidad del Aire del Valle de Aburrá.

**Picture :** Photo by Kobby Mendez on Unsplash and Jen from Pexels



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